A Comparison of Blind and Seeing Children in Certain Educational Abilities

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Floyd Franklin Caldwell, Ed. D.

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A COMPARISON OF BLIND AND SEEING CHILDREN IN CERTAIN EDUCATIONAL ABILITIES

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The original and complete manuscript of this thesis which was submitted in partial fulfillment of the requirements for the degree of Doctor of Education at the University of California, is on file in the Library of the American Foundation for the Blind.

Introduction

The Problem

STUDIES that have had to do with the blind in the past have been, for a large part, concerned with their distribution, number, color, age, sex, and age at which they became blind; degree of blindness; their condition of health; their education before blindness and since they became blind; whether they read, and if so what type or types; their occupations and earnings before and after blindness; their means of support, whether inmates of public or private institutions or living in their own homes or with relatives; the provisions made for their instruction and care; and other allied problems.

As may be seen, these studies have placed the emphasis upon a survey of existing conditions and only in very recent years has any work of consequence been attempted along experimental lines. In the particular field of educational measurement, with which this study is especially concerned, the notable contributions are limited to the efforts of a comparative few. The names of Henry H. Goddard, Professor of Psychology, Ohio State University, Thomas H. Haines of the Cornell University Clinic, Robert B. Irwin, Executive Director, American Foundation for the Blind, New York City, and Samuel P. Hayes, Professor of Psychology, Mt. Holyoke College, Massachusetts, are to be remembered especially for the work which has been done in the adaptation of the Binet Intelligence Scale for use with blind pupils. Dr. Hayes, as Director of Research at the Perkins Institution and at the Pennsylvania Institution for the Instruction of the Blind at Overbrook, has probably done more than any other investigator in applying modern experimental technique in the solution of problems encountered in the education of the blind.[1] The work which has been done under his direction in standardizing the Binet tests and the studies which he has made of reading and writing difficulties are especially noteworthy.

In the adaptation of the Binet Scale much was learned regarding the general intellectual abilities of the blind and through the use of this scale much has been accomplished in raising the standards of instruction. In segregating the feeble-minded from the mentally normal the Binet has been particularly helpful and its use with the blind has quite definitely proven that mental measurement of the individual type, at least, can be administered successfully in schools and classes for the visually defective.

With the adaptation of the Stanford Achievement Test for use with blind pupils by Miss Kathryn E. Maxfield of the American Foundation for the Blind, new problems and many interesting possibilities for future study have been presented. These tests give the most reliable information to be had as to how the school achievement of visually defective children compares with that of the visually normal. They provide qualitative and quantitative data as to the relative abilities of blind and seeing children, and by careful analyses of these data we are able to discover and measure objectively the particular handicaps or advantages which the blind may have.

Statement of the Problem

This study is an attempt to compare the abilities of blind and seeing children by means of the results obtained on the Stanford Achievement Tests.

Delimitation of Problem

Only the Reading Tests I., II., and III., Forms A and B, were used in this study. The group of blind pupils included all of those enrolled at the California School for the Blind who could read and write braille readily. This necessitated confining the study to the junior high school group. The seeing pupils included all of the low seventh grade in the junior high school department of the Oakland High School.

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[1] Maxfield, Kathryn E. "Adaptation of Educational Tests for Use with Blind Pupils."

Methodology

The technique used in giving the tests and the method of treatment of data are described in detail in section II.

I.

Changing Conceptions in the Care and Treatment of the Blind

In presenting this study of the comparison of blind and seeing children in certain educational abilities, it has seemed advisable, for purposes of orientation, to describe briefly the place which has been accorded the blind in ancient and more modern society; to present some of the attitudes which have prevailed concerning them; and to show how concepts previously held, which were based upon opinion alone, are being gradually displaced or modified by the results of those investigations which have employed more refined methods of measuring individual differences.

From the evidence available it seems logical to assume that the blind have been with us almost from the beginning of human life.[2] The treatment accorded them by primitive man is, of course, somewhat a matter of conjecture. We are fairly certain, however, that extermination of those persons who had become a burden upon the group was practiced quite generally.[3] In order to understand more clearly the motives which prompted such seemingly inhuman treatment it is well to turn to a body of data that concerns primitive groups still living in the world today.

Anthropologists conclude from their studies that primitive man had much the same mental and physical problems to solve as those which confront his more civilized descendants. The contrasts in general conclusions as to methods employed in the solution of these problems are due, not so much to differences in mental abilities of civilized and uncivilized groups, as they are to the differences that exist in the body of facts which have been accumulating gradually throughout the ages.

Thus we find primitive man struggling with individual maladjustments and crime. He overlooks to a large extent the individual differences of a mental character that exist among men. He thereupon ascribes these deviations from normal to certain self-moved, mystical forces and treats and punishes them accordingly. He builds about these unfortunate deviates a body of superstitious practices based upon misinformation and misconception; and the form which these practices assume is governed largely by the intensity of the struggle for existence. The struggle for self-preservation is ever present and the economic problem is one of great importance. Therefore, primitive man, in his attempt to control his environment, incorporates into his religion rules and regulations which demand extermination of those unable to bear their share of burden.[4]

As culture increases, we find many primitive practices becoming more and more limited. In early Greece and Rome, extermination was still resorted to, but the practice seems to have been confined largely to exposure of infants. The power of determination as to whether the child should live rested largely with the father. As civilization advanced, the father's power was more and more curtailed. Thus we find the law of Romulus[5] stating that a misshapen or monstrous child should be exposed only after it had been shown to five neighbors and their consent secured. It lay, however, within the power of the mother to nullify the father's decision simply by giving the child some of her own milk or some honey, both of which were considered sacred. This custom continued among the Germans even after the introduction of Christianity, but with them exposure had to take place before baptism.[6]

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[2] Tylor, Edward B. *Anthropology*, pp. 400-440.
[3] *Ibid.*
[4] *Ibid.*
[5] Kretschmer, Reinhold. *Geschichte des Blindenwesens*, unpublished MS translation by French, Richard Slayton.

Among the Jews exposure was prohibited on the ground that a child was a gift of the Lord and belonged to Him.[7] In Thebes the poor Theban was allowed to sell his new-born child to anyone who wanted to buy, and the child later became the slave of the one who reared him.[8] In some instances, however, where infant extermination was practiced, the custom seems to have prevailed to the effect that if a child was once recognized by the father, it became a member of the group and could not legally thereafter be exposed. Obviously many persons afflicted with blindness, which was not clearly apparent at first, had already been accepted into the family circle and were thereafter regarded as rightful members.[9]

Tracing the literature of various races, we find frequent mention of the blind and we are able to judge in some measure the treatment accorded them. We must approach the problem with caution, however, in order that isolated cases may not cloud the issue of the treatment of the blind in general.

In China, which very early attained a high level of culture, the blind were early given the training necessary for them to become seers.[10] In India, where oral tradition played such a part, the blind belonged to the class which acted as depositories of religious and poetic lore.[11] During the reign of the Buddhist Kings a social policy was adopted by the State 250 B. C.) which provided that sanatoria and hospitals be erected at public cost, and we are led to the inference that at that early date the blind must have enjoyed some degree of public care.[12]

Ancient Hindu literature bears witness to the humane treatment of the blind, and Egypt closely rivals India for honors in having built up a system of public welfare in the ancient period. At the time of the later Greek kingdoms, the care of the blind was already established and applied especially to the blinded soldiers of the armies under the Seleucids and Ptolemies.[13] Among the Greeks, also, the blind were sometimes honored as seers and prophets. A certain superstition seems to have clung to them. It was thought that they could enter into union with the supernatural powers and were often chosen by the gods for the prediction of coming events. Here also we find a definite theory of divine compensation prevailing. "It was thought that to this divine compensation Tiresias and Phineus owed their gift of prophecy, Demodocus his gift of song, and with Homer, too, his supreme poetic gift was attributed to the motive of compassion for his blindness."[14]

Although Rome took over much from the Greek state, it did not incorporate into its culture a humane attitude toward the weak and defective. The Romans were liberal but not charitable. Public distributions were made as political expedients in order to keep the goodwill of the masses, but no attention was accorded the individual sufferer. The blind were therefore forced to eke out their lives as suffering, despised beggars, and were frequently exploited and terribly mistreated by conscienceless speculators who sought to capitalize upon what pity might be aroused by the affliction. It was not uncommon for blind boys to be trained as beggars or sold as rowers and for blind girls to be sold into a life of prostitution.[15]

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[6] Kretschmer. *Op. cit.*
[7] *Ibid.*
[8] *Ibid.*
[9] *Ibid.*
[10] *Ibid.*
[11] *Ibid.*
[12] *Ibid.*
[13] *Ibid.*
[14] *Ibid.*

Man's worth during the classic period was measured largely in terms of his value as a citizen. This concept was destined to give way to a gradual growth of the consciousness of individual worth and a respect for personality. The fundamental laws of Christianity placed the emphasis upon individual salvation and very early advanced the principle of charity and helpfulness toward the afflicted.[16]

Among the Hebrews, where Christianity had its birth, there appears to have been no public care of the blind, but private obligation towards the needy was amply expressed in law. Although the Jews made no provision for education of the blind, we do find attempts made to provide for them gainful employment. The occupation of grinding the hand-mill was quite common and this labor served as a kind of standard in determining the time value of a blind person's efforts.[17] With the advent of Christianity we find much the same spirit prevailing as to the obligations towards the poor and afflicted.

Carrying on in this same spirit of charity, places of refuge were established in the fourth century by St. Basil at Caesarea in Cappadocia; and during the next two centuries similar hospices were established at Syr in Syria and in Jerusalem. These efforts, however, were only feeble attempts and failed to compensate in more than a small measure for the attitude of brutal indifference which continued to prevail from at least the Roman period well into the Middle Ages. On the whole the blind seem to have been considered as a class apart. They were to be found for the most part in the market places and at the city gates appealing to the pitying charity of the passer-by. With the possible exception of that found among the Hebrews,[18] no theory of self-helpfulness seems to have been in evidence.

About the beginning of the thirteenth century, the blind, like the students and tradesmen, began to organize themselves into guilds or brotherhoods. In the year 1260, Louis IX recognized such a corporation and provided an asylum, known as the Hôtel des Quinze-Vingts, in which several hundred blind persons took refuge.[19] This institution and others of like nature are significant in that they mark the beginning of a change of attitude.

Blindness had long been considered as one of the divinely ordained afflictions to which the human race is heir. It had been accepted as a natural part of the order of earthly existence. A certain fatalistic philosophy seemed to permeate the thinking of not only the intellectual leaders but the general population as well. There was little questioning as to whether any fraction of the blind population might have been kept from becoming thus afflicted, whether their condition might be ameliorated by education, or whether or not they might be made useful members of society. The organization into large groups brought the problem of the blind more forcibly to the attention of society at large. The fact that the blind took advantage of their newly found power in numbers and of the royal favors granted to them, also helped to make society feel the problem more acutely. Further, this congregation into larger groups brought about a keener realization of the prevalence of the affliction. These influences, coupled with the efforts of a comparatively few intelligent and persevering blind individuals themselves, brought about a gradual development of an attitude which was destined eventually to culminate in a definite educational policy.[20]

Among the first serious attempts to bring instruction to the sightless was that of Girolimo Cardano (1501-1576), the Physician of Pavia in Italy.[21] He conceived the idea of teaching the blind through the sense of touch, and attempted to procure, to some extent, instruction for them. About the same time, Peter Pontanus, a Fleming, published a book regarding the blind and in 1670 another treatise appeared by Padre Lana. There is evidence, also, that some effort was made in Switzerland to afford instruction to blind persons.[22] These efforts, however, were sporadic and isolated, with no concerted efforts, and no attempts at group education. Nevertheless, here were the beginnings of a saner and wiser principle of self-helpfulness. The foundations were being built for future progress.[23]

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[15] Kretschmer. *Op. cit.*

[16] French, Richard Slayton. "The Education of the Blind," Pt. 1., p. 2.

[17] Kretschmer. *Op. cit.*

[18] French. *Op. cit.*, p. 2.

[19] *Ibid.*

[20] *Ibid.*

Near the close of the eighteenth century in France the real work of the education of the blind began. The name which stands above all the rest in this great movement is that of Valentin Haüy. His interest and sympathy were aroused by coming in contact with methods of exploitation practiced by unscrupulous seeing persons in dealing with the blind. He thereupon set about to gather all the information that was possible regarding them, especially as to previous attempts at giving them instruction. Finding that educational processes hitherto were meager and practically useless, he set about to devise ways and means by which instruction might be given. In 1784 he took a blind boy who was found begging on the streets, and, giving him pay as compensation for his loss of occupation, began his series of experiments. In this manner began the first school in the world for the blind.[24] This institution was at first supported by private subscription and donations. But in 1791, after the outbreak of the Revolution, the school was taken over by the State and continued thereafter as a public institution.

Within a few years schools were opened in most of the important cities of Europe; in fact, education for the blind was well established before America felt the need of taking up the task of instruction.

Early in the nineteenth century inquiry began as to the possibilities of education for the blind in the United States. The answer was forthcoming from Europe, and was brought by Dr. John D. Fisher, a Boston physician who had visited the school of Haüy at Paris. Dr. Fisher was very favorably impressed by the results that were being obtained there. Shortly afterward, the New England Asylum for the Blind was established, later to be known as the "Perkins Institution and Massachusetts School for the Blind." Dr. Samuel Gridley Howe was selected to begin the work. After a trip to Europe to study the methods used there, he returned and opened the school in 1832.[25] Schools were started at about the same time in New York and Philadelphia. Gradually as the states began to realize their responsibility to the defective members of society, schools were established in nearly all of them. Today the theory is generally accepted that education for the blind is not only a function but also a duty of the state.

It is quite significant to note that many of the very early references to the blind were of a psychological character. Locke in his "Essay Concerning Human Understanding," Berkeley in his "Essay toward a New Theory of Vision," and Diderot in his *"Lettre sur les Aveugles,"* speculate upon the psychological problems presented.[26] The movement for greater objectivity, however, was destined to be postponed nearly two centuries longer before more speculations were to be supplemented by anything approaching experimental techniques.

The movement for greater objectivity in measurement—psychologically, physically, sociologically and educationally—probably owes its present status to at least four lines of approach: (1) experimental psychology;

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[21] Best, Harry. *The Blind,* p. 255.

[22] *Ibid.,* p. 256.

[23] French. *Op. cit.,* p. 2.

[24] Best. *Op. cit.,* p. 257.

[25] *Ibid.,* p. 264.

[26] French, Richard Slayton. *The Education of the Blind.* Thesis, University of California, Intro. v.

(2) the study of individual differences; (3) the growth of eugenics; and (4) anthropological measurement. The establishment of Wundt's laboratory in Leipzig in 1879 may be said to mark the beginning of experimental psychology. The apparatus and methods of physiology and physics were pressed into the service of the new science and shortly experiments were being carried on in an attempt to determine the reaction of individuals to visual, auditory, and cutaneous stimuli. The differences between observers, however, soon led to the study of different types of reaction, and studies dealing with so-called sensory, motor and mixed types, began to appear. As a result, a study of individual differences with all its ramifications arose in the psychological laboratory, and in the last decade of the nineteenth century considerable work was completed in this field.[27]

Approaching the problem of individual differences from a slightly different angle, Sir Francis Galton published his well-known *Hereditary Genius* in 1869, and his *Inquiries into Human Faculty* in 1883. In the introduction of this latter book he says: "My general object has been to take note of the varied hereditary faculties of different men, and of the great differences in different families and races, to learn how far history may have shown the practicability of supplanting inefficient human stock by better strains, and to consider whether it might not be our duty to do so by such efforts as may be reasonable, thus exerting ourselves to further the ends of evolution more rapidly and with less distress than if events were left to their own course."[28] Although showing in this paragraph a definite influence of the school of biological thought, he was obviously influenced also by the Lockian psychology, since later in the same volume he draws the very interesting conclusion: "The only information that reaches us concerning outward events appears to pass through the avenue of our senses; and the more perceptive the senses are of difference, the larger is the field upon which our judgment and intelligence can act."[29]

Working with this conclusion in mind, Galton constructed numerous tests for measuring the acuity of the senses and very definitely anticipated at this early date the essentials of the theory of mental tests. His greatest contribution, however, to objective measurement is doubtless the work of developing various mathematical methods of handling data statistically. The method of correlation, which in its fundamental properties was discovered and presented graphically by Galton from 1877 to 1888, has been used quite extensively in this study of comparison of blind and seeing children.

At a slightly later date Binet and Simon, building upon the work of Sequin, were developing tests which proved to contain the germ of the first intelligence scale, the Binet-Simon scale of 1905.[30] In 1908 and 1911 revisions appeared to meet deficiencies they themselves had discovered and to satisfy the criticisms of their colleagues.[31]

In 1910 Dr. Goddard, recognizing the value of the Binet tests, translated them into English with some modification to adapt them to American conditions, and gave them to about 2,000 school children.[32]

In 1914, Mr. Irwin, recognizing the advisability of separating the feeble-minded blind from the superior groups began, with the assistance of Dr. Goddard, a revision of the Binet to be used without the use of vision. After a number of tentative tryouts, Mr. Irwin arranged to have Dr. Haines test the pupils of the Ohio State School for the Blind. In 1916 Dr. Haines published a report upon his use of the year-scale and presented a revision of the Yerkes Point Scale adapted for use with the blind.[33] About the same time Dr. W. B. Drummond was working with blind pupils in England and Scotland and, building upon the work of Irwin and Haines, he published two articles in 1920, "A Binet Scale for the Blind," and "A Provisional Point Scale for the Blind." During the same period, systematic routine testing had also been begun in Perkins Institution at Watertown, Massachusetts, the State School for the Blind at Batavia, New York, and the Pennsylvania Institution for the Instruction of the Blind at Overbrook, Philadelphia, Pennsylvania. This work was directed by Dr. Hayes who was assisted by Miss Maxfield at Perkins and Mrs. Ruth Crane Wright at Overbrook. By 1923 the Binet tests had been given to more than 1,200 blind or nearly blind children, and an attempt was made at standardization. A guide was published and distributed for the use of competent persons in schools and clinics where it might be necessary to examine children who had not enough vision to take the Binet tests in the ordinary form. This revision, however, was provisional, and wider use of the tests has indicated that possibly the norms established were too favorable to the blind. As a temporary expedient for making comparisons of the blind and the seeing, a "Comparison Sheet" has been issued so that testers might score the blind on a scale similar to that used for the seeing.[34]

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[27] Pintner, Rudolf. *Intelligence Testing*, New Edition, pp. 12-20.

[28] Galton, Francis. *Inquiries into Human Faculty*, p. 2.

[29] *Ibid.*, p. 27.

[30] Ruch and Stoddard. *Tests and Measurements in High School Instruction*, p. 2.

[31] Hayes, Samuel P. *Ten Years of Psychological Research in Schools for the Blind*, p. 3.

[32] *Ibid.*

An adaptation of the Courtis Standard Silent Reading Tests has been made, and Dr. Hayes and his co-workers are now engaged in making an adaptation of the Monroe reading tests and the Otis group intelligence tests for use in schools for the blind. The standard tests that are now available for this particular use are practically limited to these two or three mentioned and the adaptation made of the Stanford Achievement Test by Miss Maxfield. Although this work is decidedly in its infancy, very encouraging results are being obtained. Something of the spirit with which the work is being carried on and of its importance and practical value may be obtained from the following quotation from the Perkins Institution's *Annual Report* of 1927: "To be able to measure with some definiteness both the capacity and bent of school pupils has assisted teachers in classification, in curriculum-making, and in adapting this or that school pursuit to the individual boy or girl. In other words, by conserving time, energy and patience in pupil and teacher alike it has made our teaching more a science than formerly. We now test every child on entrance and begin his education with reasonable confidence as to result. In a school of our sort such advanced knowledge has become invaluable. Also by collecting and charting the data over periods of time and by comparing these with similar findings made in other kinds of schools, we can better comprehend our own problems and struggle the more intelligently to overcome them through special emphasis rather than through following in traditional grooves. Experimentation and research into means and methods of approach and into personality, or a study of these, have not only added to the teachers' power but have also shown to the specialists among them their own convictions and peculiarities, and a need of increased broadening for fitness as educators. Our American schools for the blind, Perkins too, instead of being pedagogically ahead of most other schools for youth as they doubtless once were, because less shackled by tradition, need now rather to catch up with the times.

"Progressive education has been modifying method to such a degree of late years that we shall have to exert ourselves more than ever. Dr. Hayes' recently published pamphlet, *Ten Years of Psychological Research in Schools for the Blind* shows how very much we already owe to him and his little band of co-workers. Perkins has already joined hands with the American Foundation for the Blind in starting, at mutual expense, at our lower school of about one hundred and twenty children, scientific experimentation from which both agencies expect to gain for the education of the blind new knowledge and new power."[35]

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[33] Hayes, *Op. cit.*, p. 7.
[34] *Ibid.*, p. 8.

Review of Some Related Experimental Studies

This section would not be complete without a brief review of one or two studies in sense acuity which bear directly upon the problem at hand and also indicate how experimentation in this particular field is modifying many earlier concepts that were based primarily upon observation and opinion. The studies of Seashore and Ling on the comparative sensitivity of blind and seeing persons and of Koch and Ufkess on stylus-maze learning by blind and seeing subjects are typical of this type of experimentation.

Seashore and Ling[36] made a comparative study of sixteen blind children and fifteen seeing children in high school grades. The experiment was set to test for localization of sound, discrimination for the intensity of sound, discrimination for passive pressure, discrimination for active pressure, and tactual space. From the results obtained they conclude that there is no significant constant tendency in the records to favor either the blind or the seeing and that the extraordinary skill in guidance through hearing and pressure and other senses in the blind has its basis in perception rather than in sensation or in the direct and immediate judgment of difference. The person who learns to read the point print has learned to give meaning to sensory impressions which the seeing person tends to neglect although possessed of the same power as the blind in sensing differences. In the comparative study of stylus-maze learning by blind and seeing subjects made by Koch and Ufkess,[37] it was found that the error criterion of skill in maze performance differentiates the two visual groups more markedly than does either the trial or time criterion, that visual experience before the onset of blindness seems to reduce materially the handicap from which the blind as a group appear to suffer and that the intelligence of the subject, whether he is with or without defective vision determines, in part, the ease with which he masters the maze. Therefore, they conclude that, despite the fact that the blind place considerable reliance on tactual-kinaesthetic experience, they tend to be less successful, on the average, in maze learning of the stylus variety than are visually normal subjects.

In concluding this brief summary of these two experiments, we now enter upon the study of the comparison of blind and seeing children in certain educational abilities.

II.

Methodology

Description of Tests

The tests used in this study at the California School for the Blind were the adaptations of the three reading tests of the Stanford Achievement Test made by Miss Maxfield. This test is published in two "forms," Form A and Form B. The two forms are equally difficult and are therefore interchangeable. Each form contains three reading tests, (1) Paragraph Meaning (2) Sentence Meaning (3) Word Meaning. The tests for the blind are compiled in booklet form; each test comprises approximately ten pages, making a total of six booklets for the two forms. They are in braille grade one and one-half. In these tests, unlike those for the seeing, no provision is made for filling in of blanks or underlining the proper words in answer to the questions. It is therefore necessary for the blind child to record his answers on a separate sheet of paper. This factor influences, to a considerable degree, the time required by the blind child to complete the test.

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[35] Perkins Institution and Massachusetts School for the Blind, 97th *Annual Report*, p. 18.

[36] Seashore, C. E. and Ling, T. L. "The Comparative Sensitivity of Blind and Seeing Persons," *Psy. Mon.* Vol. XXV., No. 2, Whole No. 108, pp. 148-158.

[37] Koch, H. L., and Ufkess, J. "A Comparative Study of Stylus-Maze Learning by Blind and Seeing Subjects." *J. Exper. Psychol.*, 1926, Vol. IX, pp. 118-131.

The regular form of the same tests, by Kelley, Ruch, and Terman, were used for the seeing group. The only change made in the adaptation for the blind is in the kind of type used (braille). This factor, however, makes considerable difference in the size of booklets. For the seeing, each test requires but two or three pages to present the questions; the braille necessitates the use of ten pages to cover the same material.

Procedure in Giving the Tests

With the idea in mind of attempting to determine the extent to which the blind are handicapped in work of this nature, an accurate check of the progress made by each individual pupil was provided in the following manner. At the regular time allotted on the standard form for the seeing (Test I., 20 minutes, Test II., 10 minutes, Test III., 10 minutes) time was called and the pupils were asked to make a row of c's across their paper. Then at intervals of one-half of the regular time allotments thereafter, the same request was made, allowing 15 seconds for the process. This was continued until the pupils had reached the limit to which they were able to go on the test.

With the seeing child it was found necessary to vary the procedure somewhat in order to obtain an accurate check of progress. With this group, time was called at one-half and at three-quarters of the regular time allotted for the test, and the pupils told to draw a line after the last items attempted. An allowance of 5 seconds was made for drawing the line. The difference of time allowance between the blind and seeing was made because of the fact that the blind required triple the amount of time to make the row of c's. At the end of the regular time allowance for the test, pupils were stopped, given red pencils, and told to finish. By this method it was hoped to obtain results which might show the extent to which time is a factor to both the blind and the seeing child in a test of this kind.

With the blind, as many as six different time-interval scores were obtained; with the seeing children four were obtained.

Directions Used in Giving Tests to the Blind

"Here is a test to show how much you have learned. I will give each of you a copy of the test. Do not look at it until I tell you to. Keep your hands folded until I tell you to start work." (See that this is obeyed.) Be sure that each child is supplied with slate, stylus, and enough paper for Test I. Then say, "Now be sure to do as I tell you. Put your paper into your slate and write your name at the beginning of the first line. Then skip three cells and write Grade———. On the next line, write the date, which is ———. After the date, write the number which tells how old you are." (Since the object of this heading is to aid the scorer, it is wise to supply all the help asked for by the pupils.)

Note: It is very necessary that the scorer should know the exact age of each child in years and months in order that the child may be judged fairly on this and future tests. The examiner should verify the child's statement of his age by reference to the school record.

After the heading has been written, say, "Now, listen carefully and do just what I tell you to do. Do not begin until I say, *Go.* The very second I say *Stop,* you must stop and hold up your stylus. After we have begun, you must not ask questions. If you need more paper, hold up your hand and I will give it to you. Do your best and do not pay any attention to what any one else is doing. We want to see if you have learned as much as the children in other schools."

As an illustration of the manner in which the directions were given for each individual test those for Test I. are quoted here.

First Sitting

Test I. Reading: Paragraph Meaning

"Now, look at the beginning of the test I just gave you. Read the words at the top of the page. (See that each child has the place.) It says (read slowly): 'Dick and Tom were playing ball in the field. Dick was throwing the ball and ——— (pause) was trying to catch it. Who was trying to catch the ball?'" (Encourage pupils to answer aloud.) As soon as the correct answer is given, say: "Yes, Tom was trying to catch it. You must write *Tom* on the first line of your slates." (Pause until the word is written.)

"Wherever you see a dotted line, it means that a word has been left out. Begin with paragraph No. 1. After you have read each paragraph carefully, then write on your slate the number of the paragraph, and after it *put just one word* for each dotted line that you come to in the paragraph. *Do not write out the whole paragraph. Just write one word for each dotted line that you come to in that paragraph.* When you are through with the first page of the test, go right on to the next page. Ready—Go." (See that pupils do not stop with the first page. Try to keep all the pupils at work until time is called.)

Allow 20 minutes. Then say: "Stop. Hold your place. Make a row of c's across your paper where you left off, and go right on with the test." (Allow 10 minutes and 15 seconds more to elapse from the time you said stop; stop them again and call for a row of c's. Then at intervals of 5 minutes and 15 seconds thereafter, repeat this same procedure until all have completed the test. If a child asks to have a braille correction made, it is permissible to make it. The corrections must be of braille errors only, as for instance, changing an "L" into a "K".)

First sitting ends here. The children are allowed to move about out-of-doors for fifteen minutes.

These directions were made as nearly as possible like those given in the "Manual of Directions" for the Stanford Achievement Test, for the seeing. In giving the tests to the seeing, the regular directions found in this Manual were used except those which pertained to time limits. Here, as has been described previously, time was called at one-half and three-quarters time and children told to draw a line at the point they had reached on the test. At the regular time allotted on the test, hereafter to be referred to as single time, pencils were changed to red and children were allowed to work as long as they desired.

Method of Grading and Scoring

In order to facilitate grading and scoring, mimeographed copies of the key were made for each test. Enough of these were run off to make possible the transcribing into the Roman script of each individual blind child's responses. To supplement this a scoring sheet was also made in order that the individual scores might be rendered more accessible. The same standards of accuracy were required of the blind as were required of the seeing children. Scores were obtained and recorded at all the different time limits indicated previously in the directions used for giving the tests. Section III. gives in table form the results as they have been obtained. (P. 14 and *ff.*)

III.

The Speed Factor in Measurement of Seeing Children

With the handicap which the blind suffer, it is obvious that time must be recognized as a very important factor in the adaptation of tests like that of the Stanford Achievement Test for use in schools and classes for the blind. A number of questions arise as a result.

A. What effect does the increase of time allowance have on the results of the tests?
    (a) Are the norms established on limited time invalidated by the allowance of unlimited time?
    (b) Are there any significant differences in the behavior of scores obtained from those pupils rated as "superior" and those rated "low" on standard intelligence tests?
    (c) Does the relative position of individual pupils change materially within the group on limited and unlimited time?
    (d) Do the scores have a tendency to "bunch" at the top on unlimited time?

B. If removal of time limits does not modify appreciably the validity of the norms based on single time, what time limits should be set on the tests for the blind in order that their norms will be comparable with those for the seeing children?

Many attacks have been made on the validity of modern tests by educators and laymen who contend that the setting of definite time limits handicaps severely many individuals who are innately "slower-rated" than others. They contend that if these persons were allowed more time, their scores on any given test could be materially increased. But suppose that this occurs. Of what significance is it in the final analysis of results? We must bear in mind that "scores in intelligence tests or educational tests possess meaning only in reference to the norms of performance established for the particular test."[38] These norms are usually averages, medians, percentiles, standard deviations,[39] or some other measures derived from these so that complete removal of time limits would tend only to invalidate the norms of most existing tests. The question to consider first is: do the norms established on limited time become invalid when the time element is eliminated?

According to Ruch, if the correlation between scores earned in single time and those earned in unlimited time is found to be as high as 0.95 to 0.99, especially if it is as high as, or higher than, 0.98, there would be little practical justification for greatly increased time allowance.

Table I. shows the correlations between single and unlimited time scores in the Reading Tests I., II., and III., of Forms A and B of the Stanford Achievement Tests. These results were obtained from the tests given the low seventh grade in the junior high school department of the Oakland High School.

We may conclude from Table I. that, taking the whole group into consideration, the time limits used in the Stanford Achievement Tests, as they have been set for the seeing child, do not invalidate the tests, since they are, for all practical purposes, *power* tests as administered. As the reliability coefficient of the Reading Tests of the Stanford Achievement Tests is 0.95, it is probable that these correlations approach unity about as closely as the reliabilities of the test permit.

In further support of these data the findings of Ruch[40] are presented in Tables II. and III. Table II. gives the means, standard deviations, and coefficients of variation for the reading and arithmetic tests of the Stanford Achievement Test for single and unlimited time. Table III. gives the correlations between scores earned in single and unlimited time for the same tests.

In an attempt to answer the second question, viz., are there any significant differences in behavior of scores obtained from

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[38] Ruch, G. M. "The Speed Factor in Measurement. *Jr. Ed. Research*, Jan. 1924, Vol. IX, p. 39.

[39] Ruch, G. M. and Stoddard, George D. *Tests and Measurements in High School Instruction*, p. 60.

[40] Ruch, G. M. "The Speed Factor in Measurement." *Jr. of Ed. Research*, Jan. 1924, Vol. IX, pp. 44-45.

TABLE I

Correlations Between Scores Earned in Single and Unlimited Time for the Reading Tests of the Stanford Achievement Test—Forms A and B

THE SEEING

Form A

Test	r	P.E.	Standard Deviations		N
			Single	Unlimited	
I	.980	.0022	13.5	13.1	150
II	.982	.0020	13.5	13.6	150
III	.988	.0013	10.7	10.4	150
Composite Reading	.980	.0022	34.0	32.0	150

Form B

Test	r	P.E.	Standard Deviations		N
			Single	Unlimited	
I	.987	.0014	11.1	11.6	162
II	.991	.0009	13.2	13.4	162
III	.963	.0043	9.1	10.2	162
Composite Reading	.975	.0026	34.0	32.2	162

TABLE II

The Means, Standard Deviations, and Coefficients of Variation for the Reading and Arithmetic Tests of the Stanford Achievement Test (Ruch)

SINGLE TIME AND UNLIMITED TIME

Test	Means		Standard Deviations		Coefficients of Variations	
	Single	Unlimited	Single	Unlimited	Single	Unlimited
Composite Reading	195.9	205.4	37.2	34.1	.190	.166
Composite Arithmetic	199.8	205.9	40.1	45.7	.201	.222

TABLE III

Correlations Between Scores Earned in Single and Unlimited Times for the Reading and Arithmetic Tests of the Stanford Achievement Tests (Ruch)

Test	r	P.E.	N
Composite Reading	0.968	.005	64
Composite Arithmetic	0.976	.004	64

those pupils rated as "superior" and those rated "low" on standard intelligence tests, a study was made of the five different ability groups as classified at the Oakland High School. The National Intelligence Test and the Otis Group Intelligence Scale had been used as a basis for making the classification. Although there was some overlapping of intelligence quotients within the three middle groups, the two extreme groups, with which we are the most concerned, were fairly well defined. The range of Group I. was from 110 to 159 I. Q.; that of Group V., from 42 to 95. Table IV. gives the re-

TABLE IV

Correlations Between Scores Earned in Single and Unlimited Times for the Reading Tests of the Stanford Achievement Test

THE SEEING

Form A

Ability Group	r	P.E.	Standard Deviations		N
			Single	Unlimited	
I	.997	.0010	26.0	26.0	37
II	.993	.0010	20.6	20.5	32
III	.988	.0027	23.0	23.2	36
IV	.975	.0063	23.9	22.8	29
V	.960	.0119	24.8	23.6	21

Form B

Ability Group	r	P.E.	Standard Deviations		N
			Single	Unlimited	
I	1.00	.0000	26.0	26.0	40
II	.955	.0088	18.7	19.9	36
III	.988	.0027	23.6	22.8	37
IV	.974	.0064	24.0	22.9	29
V	.962	.0110	24.6	23.0	22

sults of correlating the single and unlimited time scores of the five different groups.

This table indicates that there was some difference in the behavior of the scores obtained from the "superior" group and those obtained from the "low" group. The correlation coefficient on both forms of the tests for the "superior" group was practically 1.00, indicating a perfect correlation. From this value the coefficients in most instances decrease gradually and reach their lowest point with Group V.

Inspection of the data shows that there is a considerable shifting about of scores for the "low" group, while the "superior" group scores indicate a high degree of stability. That is, in the latter case, the scores earned on single time are, in almost every instance, the same as those earned on unlimited time. In contrast, the scores of the "low" group show a decided upward trend in size from single to unlimited time.

Conclusions

Taking the total group into consideration, we may conclude that the time limits for the seeing child, as they have been set on the Reading Tests of the Stanford Achievement Test, are ample and that complete removal of these time limits would not materially affect the validity of the scores obtained.

However, when the group's intelligence, as measured by standard intelligence tests, is taken into consideration, and the total group is divided on this basis into five different ability groups, the behavior of the scores of the "superior" group seem to be quite different from those of the "low" group. Although the data at hand are insufficient to warrant drawing any general conclusions, the evidence seems to indicate, (1) that the superior pupils reach their maximum scores on the test under the time limits fixed; (2) that pupils with low intelligence quotients do not reach their maximum score within the assigned limits of time.

IV.

The Speed Factor in Measurement of Blind Children

Section III. presented evidence on the effect of single time and of unlimited time on scores earned by the seeing children on the Reading Tests of the Stanford Achievement Test. A presentation and analysis of the scores earned by the blind children on the same test will now be given, followed by a comparison of these scores made with those of the seeing children and an attempt made to establish time limits which will be comparable to those already established on the tests for the seeing children.

Table V. shows the correlations between the scores on Forms A and B for the blind at time intervals of 20, 40, 50, 60, and 70 minutes on Test I., and of 10, 20, 25, 30, 35, and 40 minutes on Tests II. and III. It will be noted that the procedure here has necessarily been changed somewhat from that followed in correlating the scores earned on single and unlimited times for the seeing. In Test I., the time needed for the slowest blind child to finish the test was 70 minutes. The scores obtained under this timing were regarded as being the same as those obtained in unlimited time by the seeing, and were in each instance correlated with single time (20 minutes), double time (40 minutes), and double time and one-half (50 minutes). In Tests I. and II., the 40-minute score corresponds to the unlimited score for the seeing child. These scores were then correlated with scores earned at different stop intervals. Table VI. shows the correlations between the scores obtained on the same test for the seeing at intervals of one-half, three-quarters, single, and unlimited time. In Table VII. the means and their probable errors are presented.

Inspection of Tables V. and VI. shows a very decided tendency for the correlation coefficient (r) to rise steadily, approaching a perfect correlation as more time is allowed

TABLE V

Correlations Between Scores Earned at Progressive Time Intervals for the Reading Test of the Stanford Achievement Test—Forms A and B

THE BLIND

Test I

		Time			
		20 min. vs. 70 min.	40 min. vs. 70 min.	50 min. vs. 70 min.	60 min. vs. 70 min.
A	r.......	.567	.746	.987	1.00
	P.E.....	.080	.050	.003	.000
B	r.......	.652	.855	.962	.987
	P.E.....	.070	.030	.009	.003

Test II

		Time				
		10 min. & 40 min.	20 min. & 40 min.	25 min. & 40 min.	30 min. & 40 min.	35 min. & 40 min.
A	r...	.782	.872	.97	.974	1.00
	P.E.	.046	.029	.007	.006	.000
B	r...	.66 .086	.814 .04	.89 .024	.953 .010	.986
	P.E.	.102	.05	.03	.010	.005

Test III

		Time				
		10 min. & 40 min.	20 min. & 40 min.	25 min. & 40 min.	30 min. & 40 min.	35 min. & 40 min.
A	r...	.549	.879	.975	.998	1.00
	P.E.	.083	.027	.006	.0005	.0
B	r...	.613	.859	.961	.988	1.00
	P.E.	.073	.031	.030	.003	.000

TABLE VI

Correlations Between Scores Earned at Progressive Time Intervals for the Reading Test of the Stanford Achievement Test—Forms A and B

THE SEEING

Test I

		Time		
		Single vs. 10 min.	Single vs. 15 min.	Single vs. Unlimited
A	r.......	.852	.852	.980
	P.E.....	.015	.02	.002
B	r.......	.850	.880	.980
	P.E.....	.015	.012	.002

Test II

		Time		
		Single vs. 5 min.	Single vs. 7½ min.	Single vs. Unlimited
A	r.......	.910	.947	.982
	P.E.....	.009	.005	.002
B	r.......	.854	.985	.991
	P.E.....	.014	.002	.001

Test III

		Time		
		Single vs. 5 min.	Single vs. 7½ min.	Single vs. Unlimited
A	r.......	.862	.946	.988
	P.E.....	.014	.006	.001
B	r.......	.923	.950	.962
	P.E.....	.008	.004	.004

TABLE VII

The Mean Scores and Their Probable Errors at Progressive Time Intervals for Both the Blind and the Seeing—Form A

THE BLIND AND THE SEEING

Test I—*The Blind*

	Time				
	20 min.	40 min.	50 min.	60 min.	70 min.
Means.......	50.09	72.79	80.73	82.36	82.36
P.E. (m).....	1.08	1.09	1.54	1.72	1.72

Test I—*The Seeing*

	Time			
	10 min.	15 min.	Single	Unlimited
Means.......	66.26	74.82	77.24	77.73
P.E. (m).....	.77	.77	.74	.72

Test II—*The Blind*

	Time					
	10 min.	20 min.	25 min.	30 min.	35 min.	40 min.
Means.......	24.63	41.66	48.59	49.61	51.19	51.19
P.E. (m).....	.74	1.13	1.45	1.51	1.54	1.54

Test II—*The Seeing*

	Time			
	5 min.	7½ min.	Single	Unlimited
Means.......	45.64	53.06	55.65	55.37
P.E. (m).....	.68	.73	.74	.74

Test III—*The Blind*

	Time					
	10 min.	20 min.	25 min.	30 min.	35 min.	40 min.
Means.......	24.63	40.59	40.84	41.5	41.66	41.66
P.E. (m).....	.54	1.04	1.23	1.35	1.41	1.41

Test III—*The Seeing*

	Time			
	5 min.	7½ min.	Single	Unlimited
Means.......	46.42	52.07	54.31	54.79
P.E. (m).....	.42	.6	.6	.6

for the test. On Test I., of Forms A and B, for the blind, it will be noted that the correlation is practically perfect between the 60-minute timing and the 70-minute timing. The pupils had apparently about reached their maximum at the 60-minute interval. However, an inspection of the scores for this group shows that the average number of pupils increasing their score beyond the 60-minute interval is approximately 11%.* In like manner, an examination of the scores for Test I., of Form A and B, for the seeing, shows that 12% of the seeing children increased their score after the time limit set on the test.* It may be seen also from a study of Table VII. that the average increase in size of mean of Form A and B is 0.4 score points for the blind, and that the average increase for the seeing, on the same forms, is 0.9—a difference well within the probable error of the difference of means. From these results, it seems logical to conclude that the time required for the blind on this test is 60 minutes, if their scores are to be comparable with those of the seeing.

Following the same procedure in Tests II. and III., the 35-minute time limit seems to be the reasonable one to recommend on these two tests.

It may be noted here that there is some difference in the behavior of scores at different time limits on Forms A and B. All of the pupils reached their maximum score on Form A in the 35-minute interval, whereas a large percentage failed to attain their maximum score on Form B in this time interval. It is impossible to say here just what factors were operating to bring about this result since great care was exercised to make the conditions in both instances as nearly comparable as possible. The possibility of differences in difficulty for the blind between the two forms will be discussed in Section V.

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* *See* Appendix pp. 101 and 71 of original MS on file in the Library of the American Foundation for the Blind.

It is interesting to note that the time limits herein established are not in agreement with those recommended by Miss Maxfield in her adaptation of the Stanford Achievement Test for use in schools and classes for the blind. The time limits which she recommends are 50 minutes for Test I., and 20 minutes each for Tests II. and III. Nothing is said by Miss Maxfield in her manual of directions as to the method employed in arriving at these conclusions regarding time limits.

Assuming that Miss Maxfield used a technique similar to that used in the gathering and treatment of these data, the logical conclusion to be drawn is that there was a difference in the groups used in the respective experiments. However, it is probable that the group with which Miss Maxfield worked was less homogeneous and less highly selected than was that taken as the basis of this experiment. It is not clear that this circumstance would account for her shorter time limits. An examination of the intelligence quotients (obtained by the Hayes Revision of the Binet) of the group used in this experiment, reveals the fact that the I. Q. range is from 79 to 134. The mean of this group is 103.8±1.4 with a S. D. of 12.12. Although we cannot conclude from this that the group is a superior one, nevertheless, taking the school population in schools for the blind as a whole, there is some evidence that there has been a selective factor at work in this particular case.

The facts noted in section III. regarding the behavior of scores of pupils in the lower level of intelligence might have some bearing upon the present problem, but an examination of the table of scores does not justify the conclusion that there is any constant tendency for the "low" members of the group to require a longer time to take the tests than members of the "superior" group.* There is, on the other hand, just as much evidence that those pupils with low I. Q.'s tend to "work themselves out" as soon as, or even a little earlier than, those with a higher intelligence rating.

It is very evident from observations made in giving the tests that a very great handicap is placed on blind children through the mechanical difficulties which are of necessity involved in reading and writing braille. As mentioned previously, tests for the blind require ten pages to present the same items which in type require only two or three. This factor alone is worthy of note, but the difference in the difficulties involved in recording the responses in the two groups is even more marked. The blind child is compelled to read the item first; then, taking his slate and stylus, to record the number of the item and the answer upon another sheet of paper. The fact that he must then return to the test booklet and find the next item by touch alone, necessarily increased, to a marked degree, the time required to complete the test and also introduced a greater possibility for error.

Conclusions

One conclusion which may safely be drawn from this experiment is that the time factor differentiates blind and seeing children to a very marked degree. Blind children require from three to three and one-half times as long as do seeing children to complete the tests.

Further, these data do not justify the fixing of time limits on Test I., Forms A and B, of the Stanford Achievement Test, at less than 60 minutes, or on Tests II. and III. at less than 35 minutes. Such allotments of time are necessary at least to allow sufficiently for the speed handicaps which blind children must necessarily suffer in reading and responding to braille tests of this character. If proper care is exercised in giving the tests, and if the time limits recommended above are used, the scores earned should be comparable with those of children with normal vision.

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* *See* Appendix pp. 101-8 of original MS in Library of The American Foundation for the Blind.

Finally, it may also be asserted with some confidence, on the basis of the findings of this experiment, that the time limits as fixed by Miss Maxfield are too severe and that the use of these limits as she has recommended does work an undue hardship on the blind. Furthermore, the scores obtained could not be evaluated justly with reference to the norms established for seeing children.

V.

The Relative Achievement of Blind and Seeing Children

In section IV. a comparison of the scores earned by the blind and the seeing children was made with special reference to the differences in time needed by the two groups for completing tests of this kind. A comparison will now be made between these two groups to ascertain their relative achievement.

The critical ratio has been employed to determine whether or not the differences in achievement are significant. This is found by obtaining the difference between the means of the two groups and dividing by the probable error of this difference. Assuming a critical ratio of 4 to be significant, the data show some rather striking contrasts.

On Test I., of Forms A and B, the mean scores of neither the blind nor the seeing change materially. The differences between the mean scores in favor of the blind over the seeing on the two forms are 4.63 on Form A and 6.87 on Form B. The critical ratios of 3.2 and 3.0 respectively do not show, however, the existence of a significant difference. Likewise, the ratios of 2.44, 0.0, and 0.77 show that no real difference in means exists between the blind and the seeing children. On Test III., Form A, however, there is a critical ratio of 10.4 and on Test II., Form B, there is one of 5.2. These ratios are large enough to indicate that real difference exists in the abilities of the two groups. Examination of the means on Test III., Form A, reveals a difference in favor of the seeing children of 13.13. This might indicate a vocabulary weakness for the blind, but the results on the same test for Form B show only a difference of 1.3 which offsets to a large extent the difference which exists on the other form. On Test II. of Form B, where the ratio was found to be 5.2, the difference in means is found to be 8.68 in favor of the blind. But comparison with the same test on Form A reveals a ratio of 2.44 which is not considered to be significant. Further, the difference in the latter case is in favor of the seeing children, whereas on Form B the difference is in favor of the blind. It is impossible to conclude from these data that any real difference in achievement exists between the two groups providing the time factor is held constant.

In order to determine the reliability of these tests when used with the blind, correlations have been made between the scores earned on Forms A and B, Tests I., II., and III. The results are given in Table VIII. For purposes of comparison, the reliability coefficients for these tests together with the standard deviations, as they have been determined on seeing children, are presented in Table IX.

It is well known to statisticians that the reliability coefficient of a test is a function of the variability of the group tested.[41] Variability is usually stated in terms of the standard deviation. In the case of the blind and seeing groups, the variabilities are very dissimilar, but are slightly larger in the case of the blind. Since the reliability coefficients are rather markedly lower for the blind it is not logical to attribute this observed difference to the factor of variability. On the other hand it is likely that the obtained differences are slightly smaller than

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[41] Kelley, Truman L., *Statistical Method*, p. 221.

TABLE VIII

CORRELATIONS BETWEEN SCORES EARNED ON FORMS A AND B, TESTS I, II, AND III, OF THE STANFORD ACHIEVEMENT TEST—UNLIMITED TIME

THE BLIND

Test I—Paragraph Meaning			Test II—Sentence Meaning			Test III—Word Meaning			N
r	P.E.	S.D.	r	P.E.	S.D.	r	P.E.	S.D.	
.335	.087	15.2	.526	.086	12.24	.720	.068	13.5	33

TABLE IX

RELIABILITY COEFFICIENTS OF THE SEPARATE TESTS AS GIVEN IN THE STANFORD ACHIEVEMENT TEST MANUAL OF DIRECTIONS FOR THE SEEING

Grade	Test I—Paragraph Meaning		Test II—Sentence Meaning		Test III—Word Meaning		N
	r	S.D.	r	S.D.	r	S.D.	
7	.69	14.11	.79	13.26	.89	10.73	138
8	.66	12.46	.85	12.63	.84	11.49	139
9	.76	13.01	.82	12.23	.91	11.36	121

would be obtained with strictly comparable groups. This would seem to indicate that the Stanford Achievement Test functions less reliably with the blind. This, together with the fact that the mean difference in score points earned by the blind on Test II. of Forms A and B is 7.39, and on Test III. of the same forms is 11.56, leads to the suggestion that perhaps a number of extraneous factors may have contributed to influence the obtained results. Three of these factors which might be considered worthy of note are, (1) that orientation played an important part in raising the scores on Form B, (2) that there are in Form A a number of items especially difficult for the blind which may point toward certain concept differences between the blind and the seeing, and (3) that certain difficulties are introduced into some of the test items by the braille adaptation.

From observation in giving the tests, it is very evident that the problem of orientation is an important factor for the blind. Dependent as they are upon touch alone to reveal to them the written page, they are very likely to be handicapped quite severely by the lack of previous experience in taking certain types of tests. Hence it seems that there are some tests on which the blind children should be allowed more time in order that they may become acquainted with them; and it might be advisable to construct a short practice exercise to precede such tests.

In consideration of the factor of special difficulty of test items, the percentage of error of response to each item has been carefully checked. It should be noted here that on the Stanford Achievement Test the items are arranged according to their approximate order of difficulty. This difficulty of test items has been determined by actual "tryouts" on large numbers (about 400) of seeing children. It has therefore not been thought necessary to repeat the study with this group of seeing children but to list only the percentage of errors and omissions of response of the blind to each item. A study of Test II. of Forms A and B shows considerable irregularity of response, but there is no way to determine definitely from these data that any special difficulty exists in Form A. This procedure, however, does suggest a new angle of approach to a very interesting problem of differences in characteristic concepts which might exist between the blind and the seeing child.

A study of Test III. of Forms A and B also shows some irregularity of response to the test items, and here, in one instance at least, a difficulty has been introduced for the blind by the braille adaptation. Item 46, Form B, shows a percentage error of 81. On item 45 just preceding, the percentage of error is 15 while on that following, number 47, the percentage of error is 27. The difference in question difficulty is therefore very obvious. The item as given in the test is, "To welcome is to receive ABRUPTLY CAUTIOUSLY CORDIALLY HASTILY HAUGHTILY." The proper adverb that makes the sentence complete is to be underlined by the seeing child and written in braille by the blind child. Examination of responses to this item reveals the fact that all of the blind children wrote the word RECEIVE as a completion of the sentence. In this case the fault lies quite obviously in the test item itself and is not due to any peculiarity of the blind. By reference to Form B, Test III.,* it may be seen that "To welcome is to receive" is printed in regular type, whereas, the adverbs following are in bold-face type. With the adaptation into braille no distinction was made in type and therefore the pupils answered by giving the word RECEIVE which makes for complete meaning of the sentence.

These results do not warrant the conclusion that Form A is any more difficult than Form B. If there are test items which are of special difficulty for the blind, they are fairly well distributed in Forms A and B. The defective item referred to above is in Form B, but this is the form on which the blind earned their best score. Therefore, it seems that the factor of orientation is a very important one for the blind in reading and responding to test items of this particular kind. This becomes even more evident when attention is called to the fact that Form A was given first and was followed only one week later by Form B. Due to the short time which elapsed between the giving of the two tests there was, no doubt, a considerable carry-over of habits formed while taking Form A. This matter of habit formation might be of considerable value to the blind because of the complexity of movement which is required of them in a test of this kind. With the formation of habits the opportunity for the blind to concentrate upon the test item itself is increased, and there is less cause for distractions to enter in, due to the complexity of the manual operations necessary in the recording of responses.

In conclusion, attention is called to the great difference of average age which is shown to exist between the blind and the seeing groups. A study of the chronological ages* reveals the fact that the average age of the seeing group is twelve years and six months while that of the blind group is seventeen years and nine months.** This difference of five years and three months is certainly very significant. It is obvious that, were the blind and seeing groups selected age for age, the achievement of the blind would fall considerably below that for the seeing. One of the contributing factors to the retardation of blind children is the late entrance age. Haines[42] finds that the age at which the average blind child enters school is from nine to ten years whereas the seeing child enters at from seven to eight years of age.* He finds further that this resulting difference in grade age continues through the grades, increasing a little in the fourth and fifth. By the time the eighth grade is reached, this difference has increased to four years. Assuming that the blind children used in this study are fairly typical in regard to the age of entrance to school, approximately three years longer has been required for them to reach the level of achievement which compares to that of the low seventh grade group of seeing children.

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* *See* App. p. 138 of original MS on file in the Library of the American Foundation for the Blind.

* *See* Appendix pp. 71-101 of original MS in the Library of the American Foundation for the Blind.

** *Ibid.*, p. 50.

Conclusions

The adaptation by Miss Maxfield of Test I., Forms A and B, of the Stanford Achievement Test is a fairly reliable measure ($r=0.535 \pm .087$ P. E.) of that particular achievement which the test measures when time allowance of 60 minutes is made in giving the test. The problem of orientation does not appear to be a serious one in a test of this particular kind.

The adaptations of Tests II. and III., of Forms A and B, of the Stanford Achievement Test are also fairly reliable measures (Test II., $r=0.526 \pm 0.086$, P. E. Test III., $r=0.720 \pm 0.058$ P. E.) of that particular achievement which the test measures when a time allowance of 35 minutes is made in giving the test.

Special difficulties seem to be encountered by the blind on first application of Tests II. and III., which might warrant the construction of short practice tests to be given before the tests are used for the first time.

No significant difference in difficulty is found to exist between Forms A and B. Hence the conclusion that the problem of orientation is an important one in these particular tests.

The achievement of the blind compares very favorably with that of the seeing when ample allowance is made for the speed handicap. Taking the ages of the two groups into consideration, however, the blind are found to be five years and three months older than the seeing children used in this experiment.

VI.

Summary of Conclusions

Taking the total group into consideration, we may conclude that the time limits for the seeing child, as they have been set on the Reading Tests of the Stanford Achievement Test, are ample and that complete removal of these time limits would not materially affect the validity of the scores obtained.

However, when the group's intelligence, as measured by standard intelligence tests, is taken into consideration, and the total group is divided on this basis into five different ability groups, the behavior of the scores of the "superior" group seems to be quite different from those of the "low" group. Although the data at hand are insufficient to warrant drawing any general conclusions, the evidence seems to indicate, (1) that the superior pupils reach their maximum scores on the tests under the time limits fixed; and (2) that pupils with low intelligence quotients do not reach their maximum score within the assigned limits of time.

By a comparison of the scores earned on the tests by the blind and seeing groups at various time intervals, the time factor is found to differentiate blind and seeing chil-

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[42] Haines, Thomas H., "A Psychological Survey of the Ohio State School for the Blind." *Outlook for the Blind,* 1916, Vol. IX, p. 90.

* The entrance age of seeing children as given by Haines seems to be a little high.

TABLE X

THE CHRONOLOGICAL AGES, MENTAL AGES, INTELLIGENCE QUOTIENTS AND READING AGES FOR THE GROUP AT THE CALIFORNIA SCHOOL FOR THE BLIND*

Pupil Number	C.A.	M.A.	I.Q.	R.A. Form A	R.A. Form B
1	17–4	16–7	105	15–2	16–5
2	18–0	17–6	110.4	16–5	16–5
3	17–4	16–10	105		12–2
4	12–5	16–7	134		14–11
5	16–11	17–3	107	13–5	13–8
6	18–10	17–8	110	13–10	15–2
7	13–11	17–3	124	12–9	12–9
8	17	16–9	105	13–6	18–6
9	14–7	14–8	103	11–10	14–2
10	21–9	15–10	98	12–0	15–2
11	18–1	14–10	92	12–8	12–8
12	18–11	16–7	103	15–7	15–10
13	18–2	16–5	105	14–2	16–2
14	19–9	15–2	94	11–10	14–0
15	16–9	19	118	14–9	16–2
16	16–6	17–8	110	15–1	17–2
17	17–4	15–7	111	12–4	13–10
18	20–6	12–9	79	12–4	12–7
19	18–6	14–11	92	14–0	13–3
20	15–3	18–0	123	15–10	16–5
21	17–3	17–2	107	15–7	17–6
22	21–4	14–10	88	12–2	12–8
23	18–9	15–8	98	16–2	16–3
24	17–1	13–4	83	10–8	10–9
25	20–10	14–4	102	11–9	13–2
26	17–0	15–9	98	11–6	11–4
27	15–10	16–9	106	15–10	16–5
28	13–5	14–11	111	12–1	12–7
29	21–6	16–3	100	12–6	13–10
30	14–9	15–10	107	13–6	16–5
31	12–6	15–6	129	12–5	15–10
32	18–6	18–6	115	15–1	15–1
33	17–5	17–7	109	12–1	11–8
34	17–7			14–9	

* The mental ages and intelligence quotients were determined by means of the Hayes Revision of the Binet Test and the reading ages were obtained from the scores earned on the Reading Tests of the Stanford Achievement Test, Forms A and B.

dren to a very marked degree. Blind children require from three to three and one-half times as long as do seeing children to complete the tests.

Further analysis of these data does not justify the fixing of time limits for the blind on Test I., Forms A and B, of the Stanford Achievement Test, at less than 60 minutes, or on Tests II. and III. at less than 35 minutes. At least such allotments of time are necessary to allow sufficiently for the speed handicaps which blind children must necessarily suffer in reading and responding to braille tests of this character. On the basis of these findings, it may also be asserted with some confidence that the time limits as fixed by Miss Maxfield are too short and that the use of these limits as she has recommended does work an undue hardship on the blind. Furthermore, the scores obtained could not be evaluated justly with reference to the norms established for seeing children.

A further study of the different tests on Forms A and B shows that Test I., on both forms of the Stanford Achievement Test is a fairly reliable measure (r=0.535±.087 P. E.) of that particular achievement which the test measures when time allowance of 60 minutes is made in giving the test. The problem of orientation does not appear to be a serious one in a test of this particular kind. Tests II. and III. of both forms are also fairly reliable measures (Test II., r=0.526±0.086 P. E.; Test III., r=0.720 ±0.058 P. E.) of that particular achievement which the test measures when a time allowance of 35 minutes is made in giving the test. However, special difficulties seem to be encountered by the blind on first application of Tests II. and III. which might warrant the construction of short practice tests to be given before those tests are used for the first time. No significant difference in difficulty is found to exist between Forms A and B, Tests II. and III. Hence the conclusion that the problem of orientation is an important one in these two particular tests.

Finally, the achievement of the blind compares very favorably with that of the seeing when ample allowance is made for the speed handicap. Taking the ages of the two groups into consideration, however, the blind are found to be five years and three months older than the seeing children used in this experiment. From the evidence cited it seems logical to conclude that the blind children have required about three years longer to reach that level of achievement indicated on the tests than the seeing children have required to reach approximately the same level.

BIBLIOGRAPHY

Best, Harry. *The Blind.* The Macmillan Company, New York, 1919.

French, Richard Slayton. *The Education of the Blind,* Parts I and II. California School for the Blind, Berkeley, 1925.

French, Richard Slayton. *The Education of the Blind.* Ph.D. Thesis, University of California, 1919.

Galton, Francis. *Inquiries into Human Faculty.* The Macmillan Company, London, 1883.

Garrett, Henry E. *Statistics in Psychology and Education.* Longmans, Green and Company, New York, 1926.

Haines, Thos. H. *A Mental Survey of the Ohio State School for the Blind.* Pub. No. 9 of the Ohio Board of Administration, Jan., 1916.

Hayes, Samuel P. *Report of Preliminary Tests in Reading.* The Pennsylvania Institution for the Instruction of the Blind, Overbrook, Philadelphia, 1920.

Hayes, Samuel P. *Ten Years of Psychological Research.* The Pennsylvania Institution for the Instruction of the Blind, Overbrook, Philadelphia, 1927.

Koch, J. L., and Ufkess, J. A. "A Comparative Study of Stylus-Maze Learning by Blind and Seeing Subjects." *Journal of Experimental Psychology,* 1926, Vol. IX.

Kelley, Truman L. *Statistical Method.* The Macmillan Company, New York, 1924.

Kretschmer, Reinhold. *Geschichte des Blindenwesens vom Altertum bis zum Beginn der allgemeinen Blindenbildung.* Ratibor, Oberschl. Gesellschaftsdruckerei. m.b.H. 1925.

Maxfield, Kathryn E. *Adaptation of Educational Tests for Use with Blind Pupils.* American Foundation for the Blind, Inc., New York, 1927.

Outlook for the Blind. Charles B. Hayes, Editor-in-Chief, issued quarterly, Vols. I to XX, inclusive. American Foundation for the Blind, Inc., New York.

Perkins Institution and Massachusetts School for the Blind, *Reports* complete (annual) 1829-1927, including special and miscellaneous reports.

Peterson, Joseph. *Early Conceptions and Tests of Intelligence.* World Book Company, New York, 1925.

Pintner, Rudolf. *Intelligence Testing.* New Edition. Henry Holt and Company, New York, 1931.

Ruch, G. M. "The Speed Factor in Measurement." *Journal of Educational Research,* Jan., 1924, Vol. IX.

Ruch, G. M. and Stoddard, George D. *Tests and Measurements in High School Instruction.* World Book Company, N York, 1927.

Seashore, C. E. and Ling, T. L. "T Comparative Sensitivity of Blind a Seeing Persons." *Psychological Mo graphs,* Vol. XXV, No. 2, Whole 108.

Tylor, Edward B. *Anthropology.* Appleton and Company, New Yo 1919.

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